

Remarks/Arguments:

I. **Status of the Application**

Claims 6-11, 13 and 21-26 are pending in this application. In the January 11, 2006 office action, the Examiner:

- A. Objected to claims 7 and 13 as including a misspelling of the word “amine”;
- B. Rejected claims 25 and 26 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite;
- C. Rejected claim 13 under 35 U.S.C. § 103(a), as allegedly being obvious over U.S. Patent No. 5,934,980 to Koos et al. (hereinafter “Koos”) in view of U.S. Patent No. 6,436,830 to Merchant et al. (hereinafter “Merchant”);
- D. Rejected claims 21-24 under 35 U.S.C. § 103(a) as allegedly being obvious over Koos in view of U.S. Patent No. 6,126,514 to Muroyama et al. (hereinafter “Muroyama”) in further view of U.S. Patent No. 5,985,045 to Kobayashi (hereinafter “Kobayashi”);
- E. Rejected claims 25 and 26 under 35 U.S.C. § 103(a) as allegedly being obvious over Koos in view of U.S. Patent No. 5,733,177 to Tsuchiya et al. (hereinafter “Tsuchiya”);
- F. Rejected claim 7 under 35 U.S.C. § 103(a) as allegedly being obvious over Koos in view of Tsuchiya in further view of Merchant;
- G. Rejected claim 8 under 35 U.S.C. § 103(a) as allegedly being obvious over Koos in view of Tsuchiya in further view of U.S. Patent No. 5,780,358 to Zhou (hereinafter “Zhou”);

H. Deemed claims 9, 10 and 11 as allegedly being dependent upon a rejected base claim but allowable if rewritten in independent format.

In this response, claims 7 and 13 have been amended to correct the minor spelling error identified by the Examiner. Claim 25 has been amended to address the indefiniteness rejection. No change to the scope of claim 25 results from the amendment. Applicants have added new claims 27 and 28. Applicants respectfully traverse the prior art rejections of the claims and respectfully request reconsideration in view of the foregoing amendments and accompanying remarks.

II. The Objections to Claim 7 and 13 are Moot

The Examiner objected to claims 7 and 13 as containing a misspelling of the word amine. Claims 7 and 13 have been amended such that the word amine is now spelled properly. It is therefore respectfully submitted that the objections to claims 7 and 13 are moot and should be withdrawn.

III. The Indefiniteness Rejection of Claim 25

Claim 25 stands rejected as allegedly being indefinite. In particular, the Examiner correctly noted that line 5 of claim 25 included a phrase “said volume of nonaqueous liquid”, and that this element lacked an antecedent basis. Applicant has amended claim 25 to replace the subject phrase with “said volume of aqueous slurry”, which removes the antecedent basis issue. The amendment does not change the scope of the claim, but rather merely embodies what was clearly intended in the original claim.

In view of the amendment, it is respectfully submitted that the indefiniteness rejection of claim 25 is moot and should be withdrawn.

IV. Claim 26

Claim 26 stands rejected as allegedly being indefinite. Claim 26 depends from claim 13. In the January 11, 2006 office action, the Examiner did not identify the terminology the Examiner deemed to be indefinite. Claim 26 appears to satisfy 35 U.S.C. §112, second paragraph. It is therefore respectfully submitted that the indefiniteness rejection of claim 26 is in error and should be withdrawn.

V. Claim 6 Still Does Not Appear to Have Been Examined

The first page of the Office Action dated January 11, 2006 states that claim 6 has been rejected. However, there is no indication under what ground or statute claim 6 has been rejected. It is not clear whether claim 6 has been examined.

However, because claim 6 depends from claim 23, which is in a condition for allowance as discussed below, it is submitted that claim 6 is also in a condition for allowance.

VI. Claim 13 is in a Condition for Allowance

This application was filed nearly five years ago, on August 30, 2001. In an office Action dated August 29, 2003, the Examiner deemed claim 13 allowable if rewritten in independent format. In a Final Office Action dated June 16, 2004, the Examiner continued to deem claim 13 allowable if rewritten in independent format.

Final rejections of the claims were appealed in an Appeal Brief filed November 16, 2004. The Examiner did not dispute the Appeal Brief and instead re-opened prosecution pursuant to an Office Action dated February 24, 2005. In the Office Action after prosecution was re-opened, the Examiner again deemed claim 13 allowable. Applicants filed a response to the February 24, 2005 office action. The Examiner then issued another Final Office Action dated September 13, 2005. In that Final Office Action, the Examiner again deemed claim 13 allowable.

In response to the Examiner's continued assertions since August 29, 2003 that claim 13 was allowable, applicants rewrote claim 13 in independent format in an Amendment After Final filed on December 13, 2005. However, the Examiner has now rejected claim 13 as allegedly being obvious over Koos in view of Merchant. For reasons that will be discussed below, it is respectfully submitted that the Examiner was correct the multiple times that the Examiner stated that claim 13 is allowable over the prior art of record.

In particular, there is no motivation or suggestion to combine the teachings of Koos and Merchant in the manner proposed by the Examiner. Even if the teachings of Koos and Merchant were combined, they would be combined in a manner that does not arrive at the invention.

A. Koos

Koos teaches a multiple step CMP process. In one step, a first slurry is used for a CMP polishing step. (See Koos at Fig. 3, step 42). Thereafter, the polishing pad is rinsed using a first and a second diluting solution. The first diluting solution is an acidic buffer

solution used to wash away particulate material and slurry. The second diluting solution includes a solvent comprising alcohol or acetone, and is used to wash away the first diluting solution. (See *id.* at Fig. 3, step 44, and col. 8, lines 2-14). The result is that the pH is carefully controlled in the process.

B. Merchant

Merchant teaches the use of a slurry that is made up of two emulsions: a first emulsion including abrasive particles and a second emulsion made up of an organic phase and an dispersed aqueous phase. The organic phase may include alcohol and allegedly an amine in the form of dipyridine. The two emulsions are used as the slurry simultaneously. (Merchant at col. 3, lines 48-60; col. 5, lines 4-18; and Fig. 1).

C. The Proposed Combination Does Not Arrive at the Invention

The Examiner stated that it “would have been obvious . . . to modify Koos’ polishing composition by including a nonaqueous solvent such as an amine that is taught by Merchant for the purpose of capturing metal particles polished from the semiconductor wafer (Merchant, column 3, lines 56-60).” (January 11, 2006 office action at p.5).

Thus, the Examiner alleges that it would have been obvious to include a nonaqueous solvent including an amine, as allegedly taught by Merchant, to the Koos *polishing* composition. The Koos polishing compound is the Koos slurry. Including an amine in the Koos slurry does not arrive at the invention. In particular, if the Koos slurry contains the nonaqueous solvent amine, as proposed by the Examiner, then the resulting

combination still fails to teach step b) of the claimed invention. Step b) requires that the *volume of nonaqueous liquid* include the amine. The Examiner has not alleged a combination that arrives at step b).

More specifically, in the rejection of claim 13, the Examiner has alleged that nonaqueous liquid of step b) of claim 13 is satisfied by the *dilution solution* as taught by Koos. (January 11, 2006 office action at pp.4-5). The dilution solution of Koos, however, is not the Koos *polishing compound*. If an amine solvent is included in the polishing compound, it would *not* affect the nonaqueous liquid of Koos. Instead, it would only affect the aqueous slurry of step a).

Thus, the combination of Koos and Merchant proposed by the Examiner does not arrive at the invention.

D. There is No Motivation or Suggestion to Combine

In addition, there is no motivation or suggestion to combine Koos and Merchant. In particular, Merchant teaches a *single* slurry mixture that includes metal removing compounds. By contrast, Koos teaches multiple mixtures used in multiple steps, including a separate diluting step in which metal removal takes place. There is no suggestion in the art that using the Merchant single slurry solution is more effective than the separate diluting step used by Koos.

There certainly is no suggestion in the art that recommends adding an amine to the Koos diluting solution. In particular, as discussed above, Koos actually teaches the use of two diluting solutions. The first solution is taught as a buffer solution that

performs removal of particulate and slurry. The second solution is taught as including a solvent, which may be nonaqueous, and is used for removing the buffer solution.

If one were to include the amine of Merchant within the first diluting (buffer) solution of Koos, the resulting combination would not arrive at the invention because there is no teaching in the art that the first diluting (buffer) solution is a nonaqueous liquid. (See Koos at col. 8, lines 2-14). Thus, even if there were a motivation or suggestion to include the amine of Merchant in the first diluting (buffer) solution of Koos, which there is not, the resulting combination would not satisfy step b).

While the second diluting (solvent) solution includes a solvent which may be nonaqueous, there is no motivation or suggestion to include an amine in that second diluting solution. In particular, it is of extreme importance in Koos to control the pH as taught throughout the specification. (E.g. Koos at col. 1 line 60 to col. 2, line 12). The purpose of pH control is to prevent chemical attack on a Tungsten layer of the semiconductor. (*Id.* at col. 1, lines 40-55). By contrast, Merchant teaches a different need to control the pH of the solution in which the bipyridine is dispersed. (E.g. Merchant at col. 4, lines 30-55). Merchant requires pH control to improve “the chemical potential gradient for metal transport across the organic phase”. (*Id.* at col. 4, lines 45-55).

There is no indication that the pH controls required by Merchant and the pH controls required by Koos are compatible. Thus, there certainly can be no teaching that providing bipyridine in the second diluting solution of Koos will satisfy the diverse pH goals of both Koos and Merchant.

For all the foregoing reasons, there is no legally sufficient motivation or suggestion to combine Merchant and Koos as proposed by the Examiner, and certainly not in a manner that would arrive at the invention.

E. Conclusion as to Claim 13

It is respectfully submitted that claim 13 is allowable over Koos and Merchant for a plurality of reasons. First, the combination of Koos and Merchant proposed by the Examiner in the January 11, 2006 office action does not arrive at the claimed invention because the resulting combination would not involve a nonaqueous liquid in step b) that incorporates an amine as claimed. Instead, only the aqueous slurry of step a) would incorporate an amine. Second, there is not motivation or suggestion to combine the amine taught by Merchant into any of the liquids of Koos. For either or both of these reasons, it is respectfully submitted that the rejection of claim 13 is in error and should be withdrawn.

VII. Claim 21 is Allowable Over the Prior Art.

The Examiner has rejected claim 21 as allegedly being obvious over Koos, Muroyama and Kobayashi. It is respectfully submitted that the Examiner has failed to make out a prima facie case of obviousness with respect to claim 21. In particular, it appears that the Examiner has alleged that Koos teaches all of the elements of claim 21 except for step a. (While the Examiner actually has admitted the Koos fails to teach step c, it is believed that the Examiner meant to say step a.) (January 11, 2006 office action at p.6).

However, as will be discussed below, Koos fails to teach steps d) and e), in addition to failing to teach or suggest step a).

As an initial matter, the Examiner has not pointed out where or how Koos teaches such steps.

Moreover, Koos fails to teach using different weight percentages of nonaqueous solvents as recited in steps a) and d) of claim 21. More specifically, Koos fails to teach or suggest “mixing said aqueous slurry containing said nonaqueous solvent so as to create a second volume of an aqueous slurry-nonaqueous solvent mixture having a greater weight % of said nonaqueous solvent than said first weight % prior to being disposed onto said semiconductor wafer”, as called for in step d). Moreover, Koos does not appear to teach mixing two different aqueous slurry/non-aqueous solvent mixtures *anywhere*, much less prior to being disposed on the semiconductor (steps a) and d)).

To this end, it is noted that the slurry provided in step 42 of Koos does *not* contain a nonaqueous solvent, and thus cannot be used to satisfy step a). The slurry of step 42 is removed by the first diluting solution in step 44 of Koos. The first diluting solution also does not contain a nonaqueous solvent. Thus, the possible transition mixture of the first diluting solution and the first slurry also fails to satisfy step a). (Koos at col. 8, lines 2-7). Then, once the slurry is removed, Koos teaches the application of the second diluting solution, which may include a nonaqueous solvent. Koos does not state that the diluting solution includes an “aqueous slurry” and thus, it would appear that the application of the second diluting solution also fails to satisfy step a). Thereafter, a second, completely different slurry is applied in step 46.

There simply is no teaching in Koos of mixing a slurry with a nonaqueous solvent. Moreover, there clearly is no teaching of mixing multiple concentrations of nonaqueous solvents and slurries, as recited in steps a) and d) of claim 21. Finally, Koos provides no teaching of mixing nonaqueous solvents and slurries other than on the semiconductor substrate itself.

As a consequence, Koos fails to teach claims a), d) and e). Because the Examiner has not pointed out where Koos, Muroyama or Kobayashi teach mixing different weight concentrations of nonaqueous solvents into aqueous slurries, and applying them in the claimed order to the semiconductor substrate, it is respectfully submitted that proposed combination of Koos, Muroyama and Kobayashi does not arrive at the claimed invention.

For at least this reason, it is respectfully submitted that the obvious rejection of claim 21 is in error and should be withdrawn.

VIII. Claims 22-24

Claims 22-24 depend from claim 21 and are allowable for at least the same reasons.

IX. Claims 25

Claim 25 stands rejected as allegedly being obvious over Koos in view of Tsuchiya. The Examiner's rejection does not constitute a prima facie case of obviousness. The entire rejection is set forth below:

Koos differs in failing to teach reducing the pressure of said polishing pad, respectively on said semiconductor wafer and said front side of semiconductor wafer prior to completing disposing a volume of nonaqueous liquid including a nonaqueous solvent onto said semiconductor wafer, **in claims 25 and 26.**

Tsuchiya teaches, "the applied pressure between the polishing pad and the wafer is simultaneously quickly decreased to reduce mechanical abrasion effects" (claim 8).

Tsuchiya illustrates reducing the pressure of a polishing pad on a semiconductor wafer is known. Hence, it would have been obvious . . . to modify Koos by using Tsuchiya's method of reducing the pressure of a polishing pad on a semiconductor wafer for the purpose of reducing abrasion effects (Tsuchiya, claim 8).

(Final Office Action at pp.7-8).

Even if all of the foregoing were true, the resultant method would not result in reducing the pressure "prior to completing disposing a volume of nonaqueous liquid including a nonaqueous solvent onto said semiconductor wafer". Indeed, the Examiner does not allege that Tsuchiya teaches any timing on reducing the pressure, much less the timing specified in the claims.

Moreover, there is no motivation or suggestion to modify Koos as proposed, nor is there a motivation or suggestion to modify Koos to include the pressure reducing step prior to completing disposing the volume of nonaqueous liquid on the wafer as claimed.

For at least these reasons, it is respectfully submitted that the obviousness rejection of claim 25 is in error and should be withdrawn.

X. Claim 26

Claim 26 depends from claim 13. Claim 13 is in a condition for allowance as discussed above. Accordingly, claim 26 is in a condition for allowance.

Claim 26 is also allowable for the reasons set forth above in connection with claim 25.

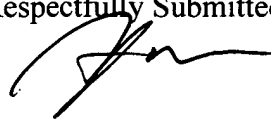
XI. Claims 7-11

Claims 7-11 depend from claim 25, which is in a condition for allowance. As a consequence, claims 7-11 are also in a condition for allowance.

XII. Conclusion

For the foregoing reasons, it is respectfully submitted that applicants have made a patentable contribution to the art. Applicant respectfully requests entry of the amendment and favorable consideration of the application.

Respectfully Submitted,



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